



SOUTHERN & EASTERN
Regional Assembly
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IRELAND WALES
2007 – 2013



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EUROPEAN REGIONAL
DEVELOPMENT FUND



Modelled larval dispersal and measured gene flow: seascape genetics of the common cockle *Cerastoderma edule*

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EGG2012, Edinburgh

SUSFISH

Shellfish productivity in the Irish Sea (INTERREG area)

The Irish Sea is an overexploited area, and shellfish represent the most diverse and important economic resource

Scope

1. producing guidelines for future fisheries management
2. ensuring sustainable development of the shellfish industry in Ireland & Wales for the next 50-100 years

Cerastoderma edule

- Cyclical mass mortalities over May-June (over 90%)

- No management in place

- No data available

- Larval behaviour?
Planktotrophic larvae
(4 weeks)



Modelling larval transport

3D Hydrodynamic Model of Irish Sea

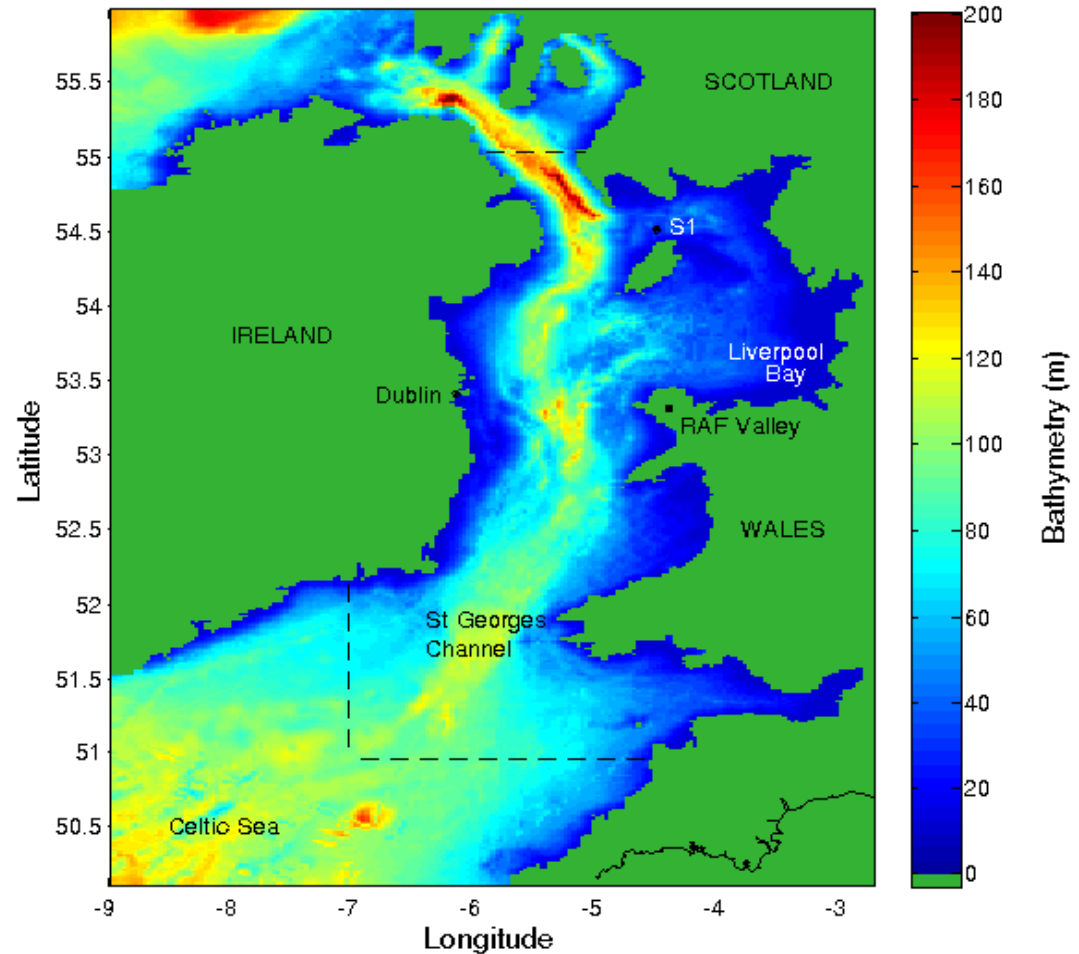
Compute: tidal currents, density-driven currents, temperatures, salinities, densities, ...

Particle Tracking Model (PTM)

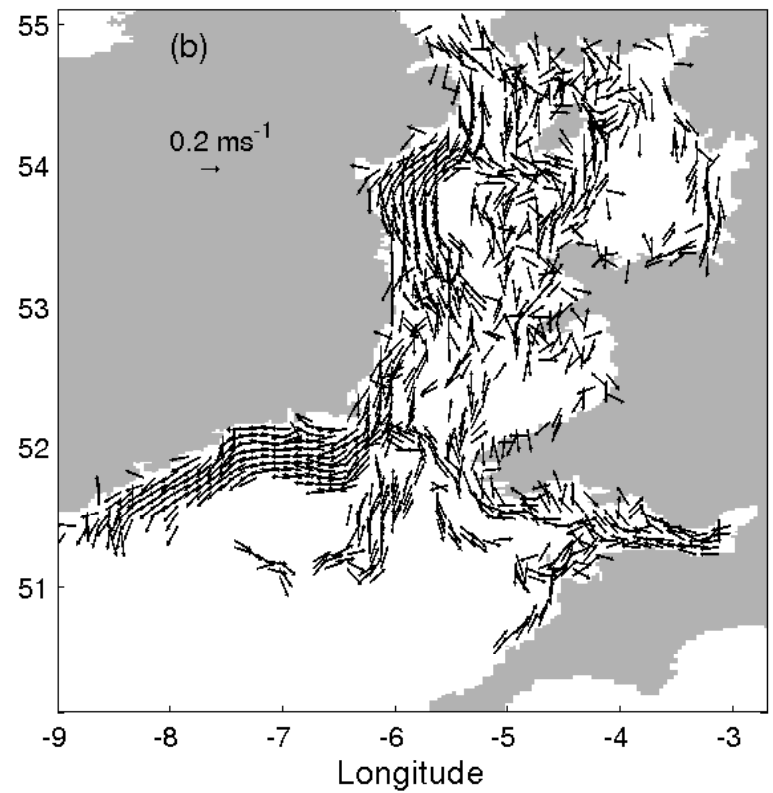
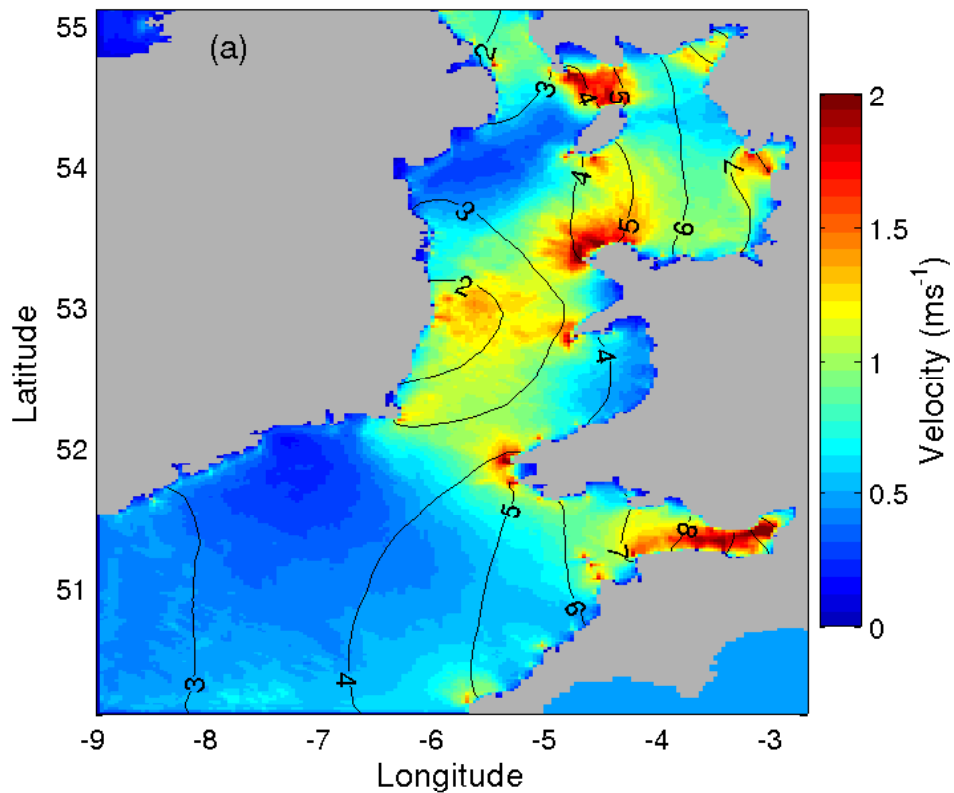
Release larvae particles and track their positions. Larval behaviours modelled: passive, tidal and diel

Irish Sea Hydrodynamic Modelling

- 2 km horizontal resolution
- 20 vertical layers
- Model forced by:
 - tidal elevations/velocities
 - wind
 - temperatures

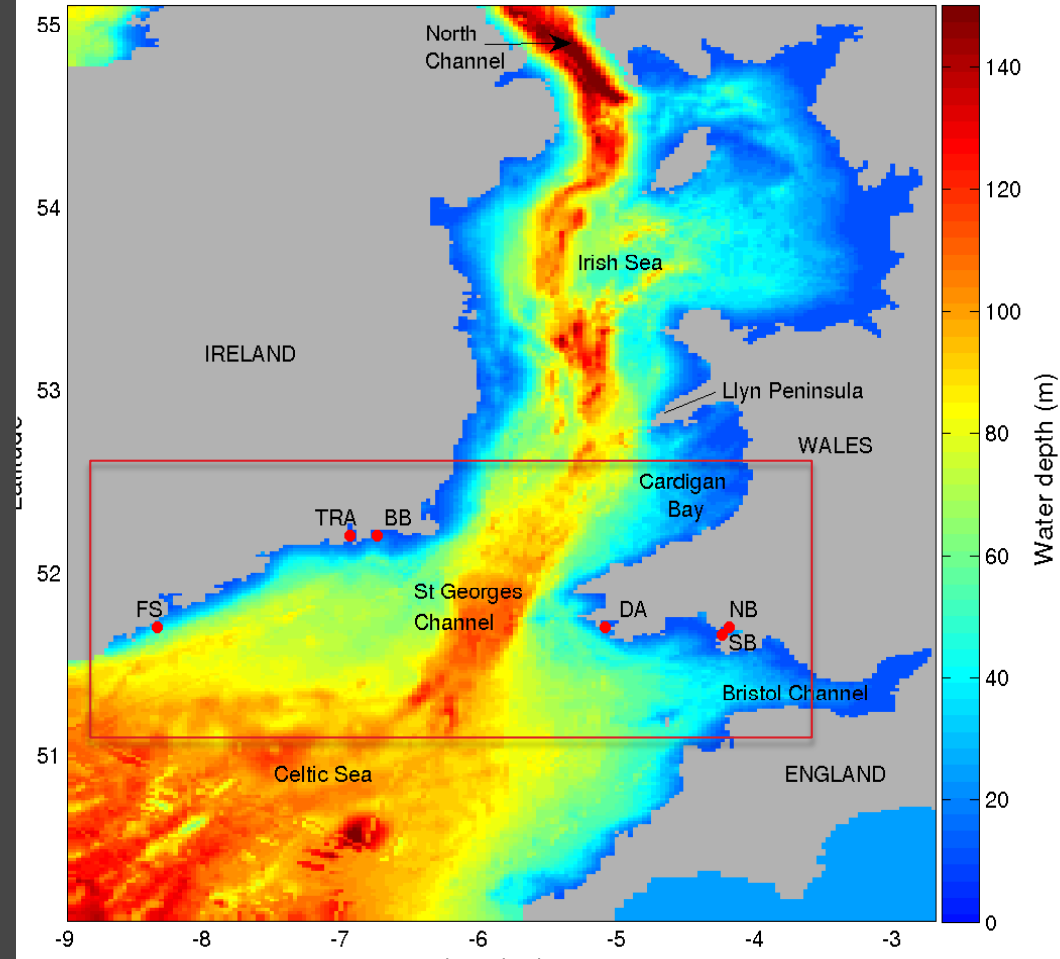


Hydrodynamic Results

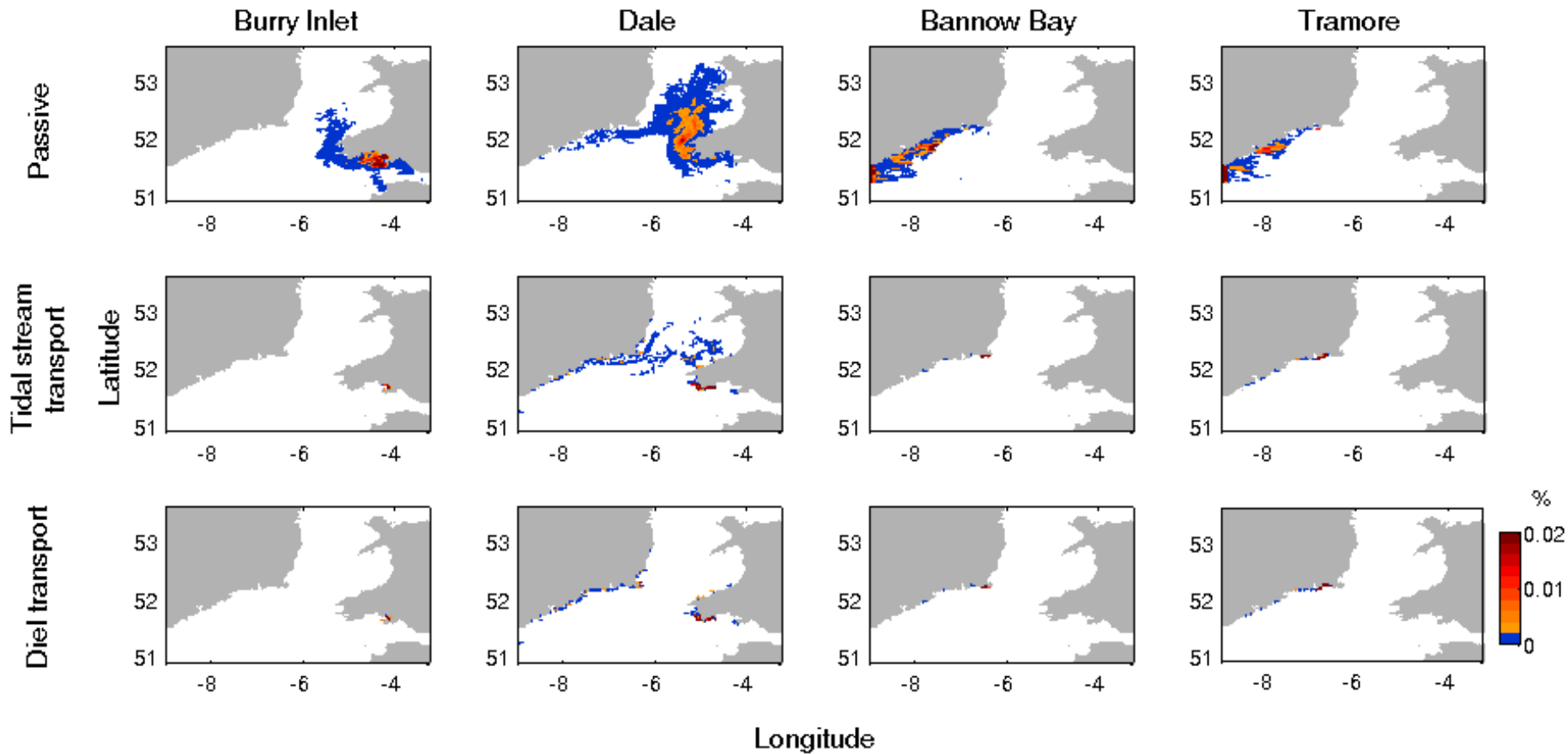


Irish Sea Particle Tracking Modelling

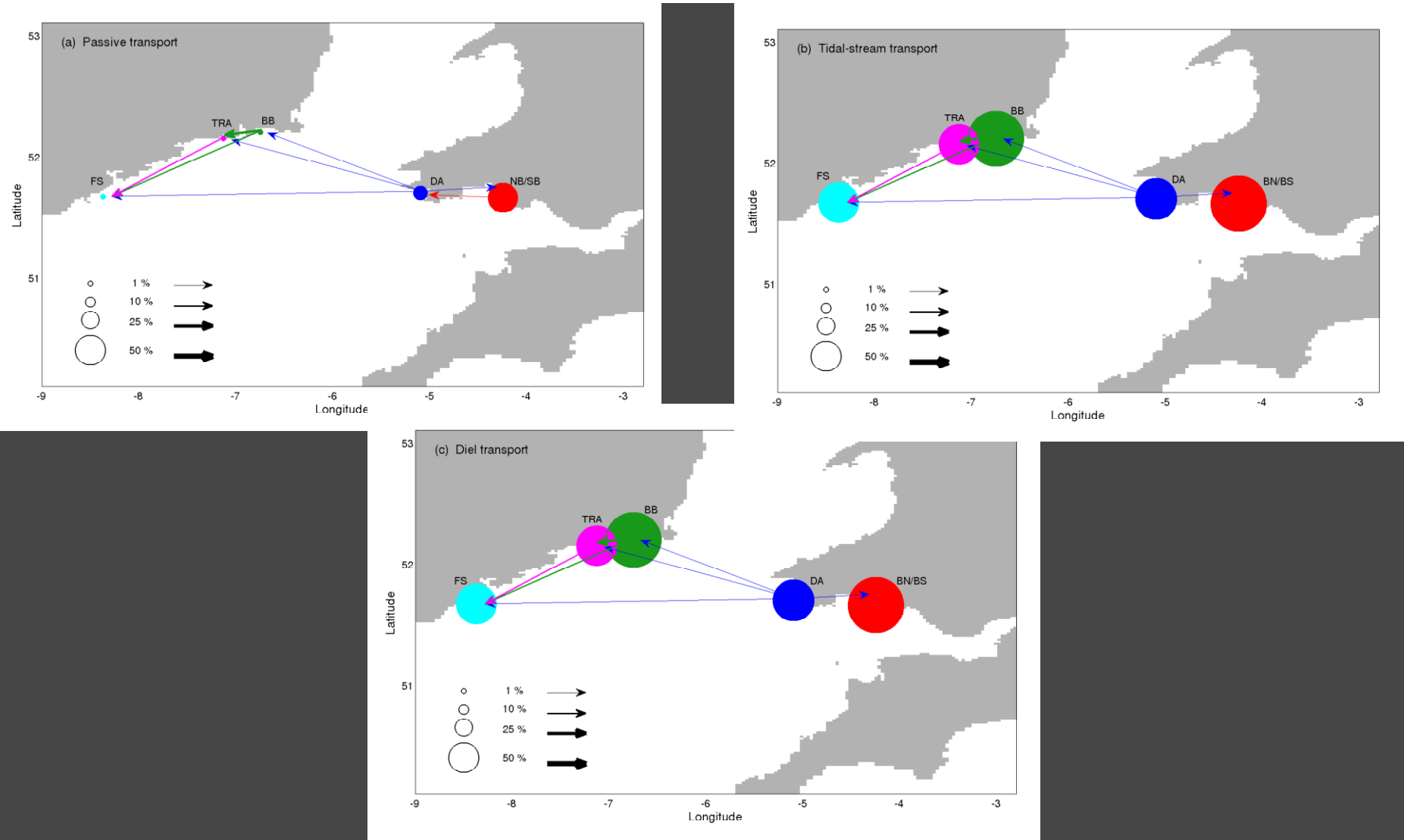
- Release larvae patches (10,000 particles) from selected estuary/coastal sites
- Release patches each month (April-Sept) at random dates
- Track each simulation for 4 weeks (estimated pelagic larval duration)
- Run each simulation with:
 - Passive** larval dispersal
 - Tidal** larval dispersal
 - Diel** larval dispersal



Larval dispersal : passive, tidal and diel transport

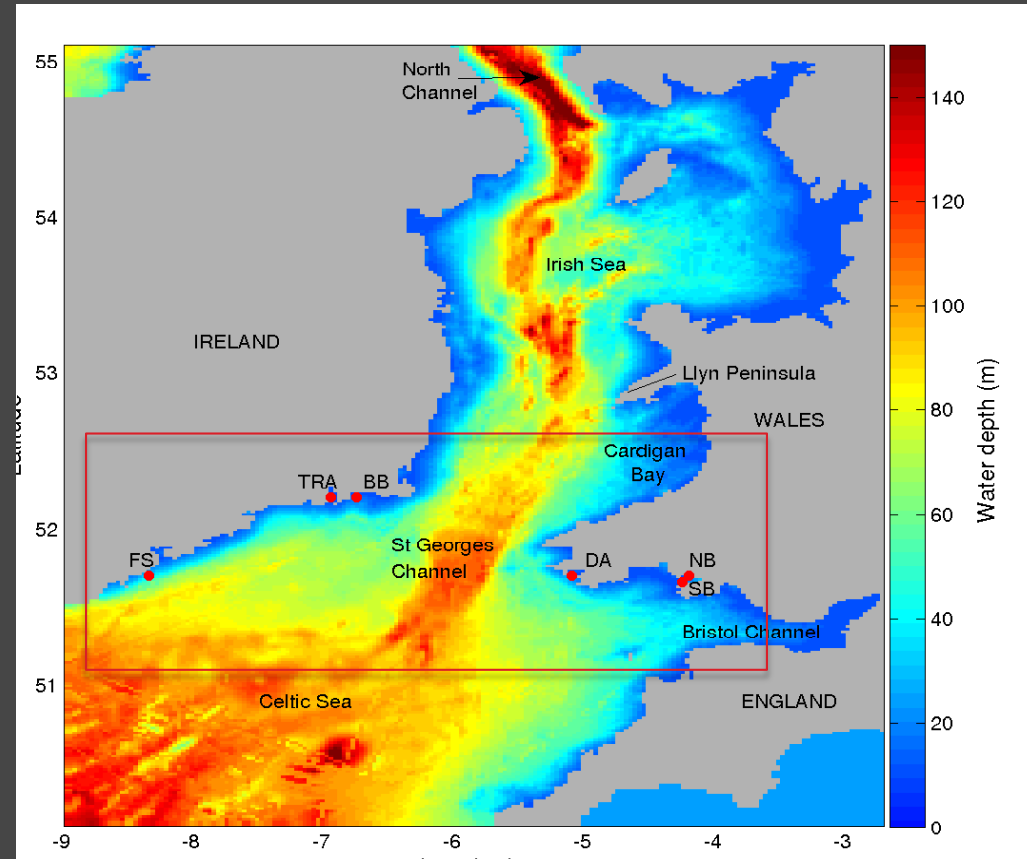


Larval retention: passive, tidal and diel transport

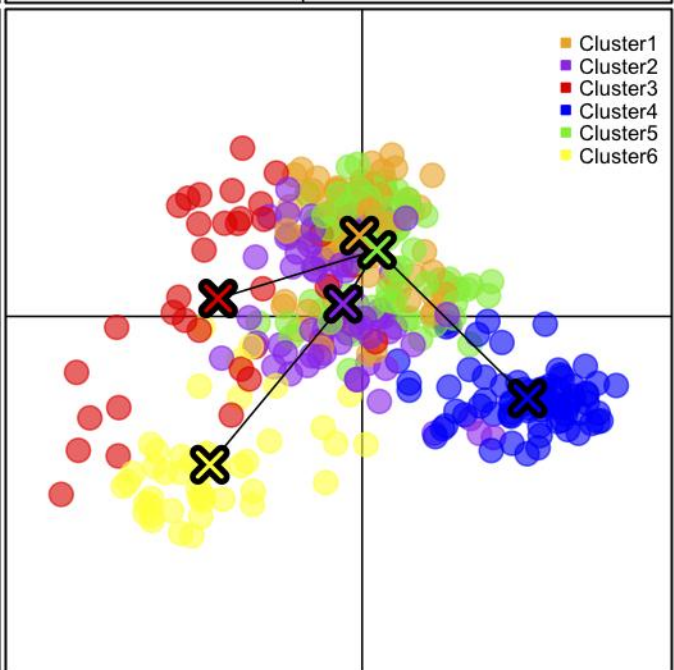
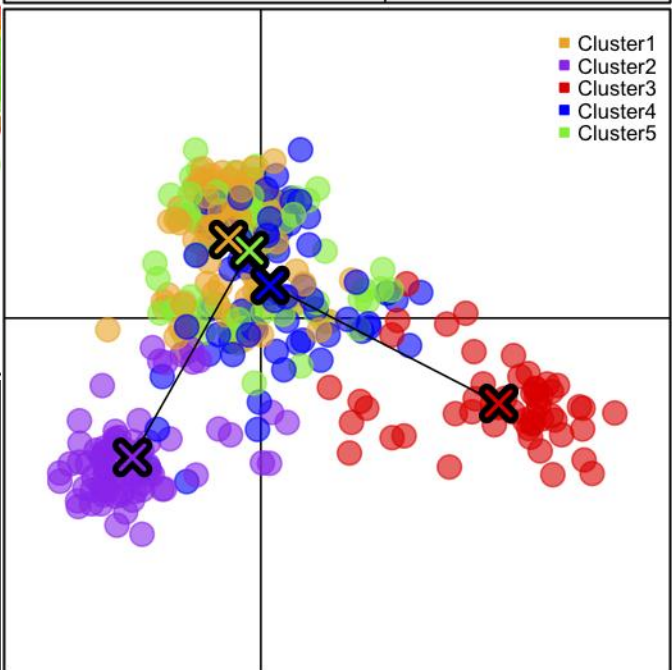
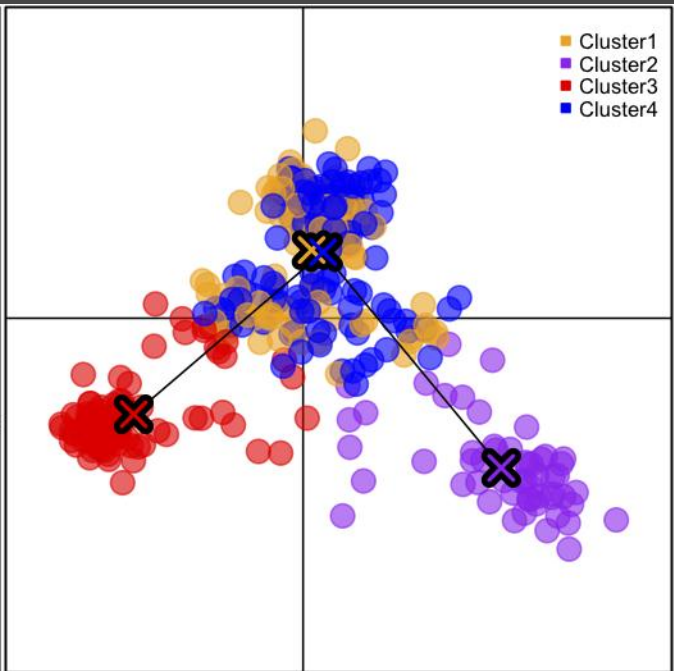
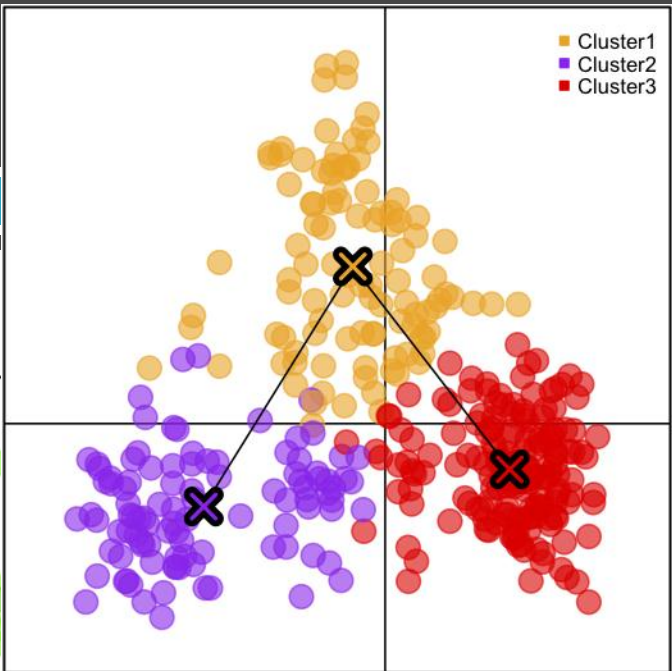
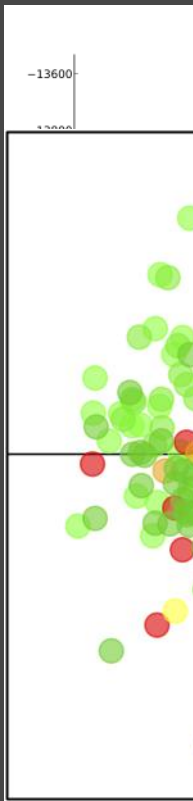


Model validation

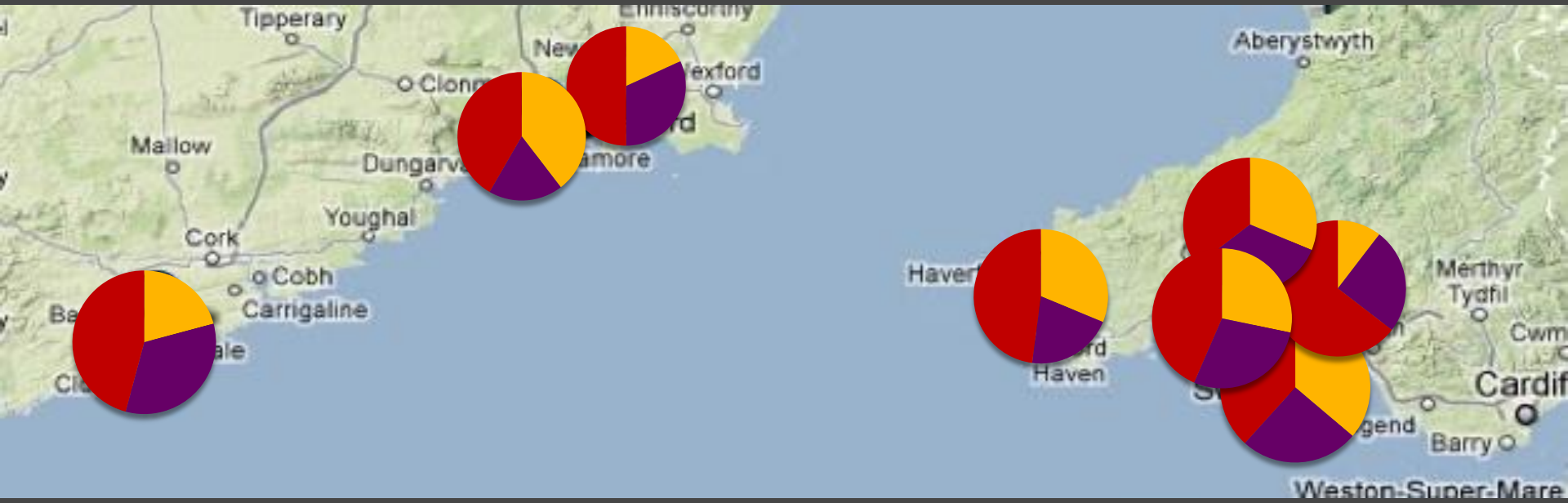
1. Focus on the Celtic Sea Front
2. Empirical data collected at the same release sites
3. 12 microsattellites
4. 48 individuals per site
5. Analysis of population structure



Ge



Population Structure



Conclusions

1. Model predicts connectivity between *C. edule* populations in the southern Irish Sea due to action of the Celtic Sea Front
2. Such prediction is supported by the genetic data
3. Residual currents influence larval transport

Acknowledgements



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